

Sri Adelila Sari & Nurul Husna. (2015). The Development of An Earthquake Mind Mapping. *Journal of Education and Learning*. Vol. 10 (2) pp. 109-118.

## The Development of an Earthquake Mind Mapping

Sri Adelila Sari\*

Faculty of Teacher Training and Education, Syiah Kuala University, Indonesia

Nurul Husna\*\*

Disaster Science Postgraduate Program, Syiah Kuala University, Indonesia

### Abstract

The students were difficult to understand about earthquake caused the teaching methods used by teachers were still using the classic method. The teachers only used a textbook to teach the students without any other supporting equipment. Learning process by using the discourse method makes students thinking monotonically, so that only concentrated on the students' understanding of the matter presented by the teacher. Therefore, this study was aimed to develop an earthquake mind mapping to help students in the process of remembering and recording the material being taught by the teacher. The type of this study was Research and Development (R & D). Data were analyzed using descriptive statistics. The samples in this study were class of I-3Madrasah Tsanawiyah (MTs) Darul Ulum Banda Aceh totaling 30 students. The results showed that mind mapping was developed by 5 stages in ADDIE models: analysis (analyzing the problem and find a solution), design (determine the learning strategies), development (producing an earthquake mind mapping to be used in the learning process), implementation (implementing learning activities using the media) and evaluation (evaluating the learning activities). When students instructed to create their mind mapping, it was found that the products of mind mapping categorized in skilled and quite skilled were amounted to 73.33 and 26.66% respectively. As recommendation an earthquake mind mapping could be applied and useful as an effective learning.

**Keyword:** *mind mapping, ADDIE, and earth quake*

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\*Sri Adelila Sari, S.Pd., M.Si., Ph.D, Lecturer at Faculty of Teacher Training and Education, Syiah Kuala University, Banda Aceh, Indonesia.  
E-mail: [sriadelilasari@unsyiah.ac.id](mailto:sriadelilasari@unsyiah.ac.id)

\*\*Nurul Husna, S.Sos.I, Disaster Science Postgraduate Program, Syiah Kuala University, Banda Aceh, Indonesia.  
E-mail: [husnazulfan@gmail.com](mailto:husnazulfan@gmail.com)

## **Introduction**

Learning media is needed to facilitate the students to remember and record the lesson by the teacher. The method used can be through a media development. The media that used in the learning process was called learning media. Sanjaya, (2012) wrote that the learning media is the whole of tools and materials that can be used for educational purposes such as radio, television, books, newspapers, magazines, and so on. The media is not only information along with the appliance, but also to learn the process, because the information known only to notice the results of other people will not make that information becomes meaningful in his life.

The existing problems in MTs Darul Ulum founded that students was difficult to understand the learning matter that presented by the teacher caused the teaching methods used by teachers are still using the classic method. The teachers only used a textbook to teach the students without any other supporting equipment. The method is usually called with the discourse method. Learning process by using the discourse method makes students thinking monotonically, so that only concentrated on the students' understanding of the matter presented by the teacher. Therefore, it must be found an interesting learning method by using media tools. The media used should be able to help students in the process to remember and record the matter taught by the teacher. Mind mapping is a method that could be support the process. Media mind mapping is a method that proved quite effective to improved students' skills. According to Buzan, (2012) this technique is a form method that is not monotonous, because it simultaneously combines the function of the left and right brain. The brain can receive information such as images, symbols, images, music and others associated with the work function of the right brain.

Mind mapping was required for students MTs Darul Ulum class I because this media was help facilitated students in understanding the earthquake matter with images, symbols and lines which could be easily absorbed by the left brain and right brain in order to make understanding students will be attached and make the learning process more interesting and fun. Rahmasari, (2010) stated that using mind mapping in learning process could be focus on object, improve an understanding and fun.

Mind mapping that has been developed here was mind mapping of an earthquakes. It was one of the materials studied in class 1 MTs Darul Ulum on the subject matter of Geography. Supriyono, (2014) stated that an earthquake is a phenomenon of shaking ground by the release of energy from the bowels of earth suddenly that effected seismic waves by the breaking of rock layers in the Earth's crust. An earthquake mind mapping consisted of: definition of an earthquake, causes of an earthquake, mitigation of an earthquake, and consequence of an earthquake.

## **Literature Review**

### **Earthquake**

An earthquake is a phenomenon of shaking ground by the release of energy from the bowels of earth suddenly that effected seismic waves by the breaking of rock layers in the Earth's crust (in Supriyono, 2014). The earthquake also defined natural events due to the movement of tectonic plates that constantly and has been for millions of years (Amir, 2012). The cause of earthquakes can be the dynamics of the earth (tectonic), volcanic activity, due to meteor falls, avalanches under the sea, and the explosion of a nuclear bomb. Tectonic earthquakes occur due to the release of energy from the movement of the earth's tectonic plates that occur suddenly. The process of energy releases of a sudden this cause vibration to the earth's surface. While volcanic earthquakes are occur due to volcanic activity caused by the movement of magma in the earth. Earthquakes occur before and shortly an eruption or volcanic eruptions (Supriyono, 2014).

Desmonda and Pamungkas, (2014) stated that the tectonic earthquake that happened a lot of physical damage and the incidence of fatalities. The cause of the earthquake is often called due to the movement of tectonic plates that cause vibration surface of the earth. To reduce the impact of a natural disaster are needed mitigation efforts. Disaster mitigation means that do actions to mitigate the adverse effects of the disaster before the danger occurs.

### **Mind Mapping**

Widura, (2008) explained that the concept of mind mapping was originally introduced by Tony Buzan 1970. This technique is also known as radiant thinking. A mind map has an idea or central word, and there are 5 to 10 other ideas that came out of the central idea. Mind maps were very effective when used to bring up the idea that we have hidden. Diagram form like a tree diagram and the branch makes it easy to convey information to other information. Mind map is preparation of the notes system to help students used the all potential of brain to work optimally by combining the left brain and the right brain.

Mind mapping is a technique noted that developing visual learning style that uses words, colors, lines, and images to integrate and develop the potential of the brain that allows a person to manage and remember all forms of information, both written and verbal making it easier for the brain in absorbing the information received. Because our brains to think in terms of color and image. This map can generate original ideas and spark memories with ease. Mind mapping technique invites students to explore their potential to become learning in life (Sapitri, 2010).

### **ADDIE Model**

Hartanto, (2013) said that ADDIE learning model can be used as an alternative in learning. ADDIE learning model was applied to student so they were not saturated and become more active and creative. Febrianto, *et al.*, (2015) mentioned that it was one of the ADDIE model is one of learning system that systematic. This model has five steps, that is:

- 1) Analysis: defining the problem and the appropriate solution and determine student competency.
- 2) Design: determine specific competencies, methods, teaching materials, and learning strategies.
- 3) Development: producing mind mapping to be used in the learning process.
- 4) Implementation: doing learning activities by implementing a media mind mapping in the learning process.
- 5) Evaluation: evaluation of learning activities by media mind mapping and see the impact of media development mind mapping to the students' knowledge and preparedness to disasters.

ADDIE model was a model that arranged in program sequences of activities systematically to solving learning problems related to learning media in accordance with the needs and characteristics of students (Susanta, *et al.*, 2014).

### **Research Method**

Type of this study was the Research and Development. Time research began on August to October 2015. The population in this study was students of MTs Darul Ulum class I totaling 119 students. Samples were taken from the representation of school community groups, as many as 30 students. Data obtained from the students' mind mapping and assessment of the feasibility of the media. The data were analyzed using descriptive statistics. The result of students' mind mapping were assessed based some the indicators assessed. In the media feasibility assessment is validated by two expert validators consisting of one expert in social studies and an expert in education studies. Feasibility of media is determined by the results of the validation.

### **Results and Discussion**

#### **Analysis**

Subana, (2014) in her study explained that the analysis stage was performed using the method of recording documents. It was done by recording the steps that have been carried out in accordance with the procedure development. Putra, (2015) found that the analysis stage included activities such as: 1) analyzing the competence of learners, 2) analyzing the characteristics of learners on learning capacity, the knowledge, skills, attitudes that have held the learner, and 3) analyzing the material in accordance with the demands of competence. Another research by Premana, *et al.*, (2013) showed that the analysis stage begins with a survey of learners and the learning environment to determine the learning problems are the main priority.

According to Sanjaya, (2012) learning media is the whole of tools and materials that can be used for educational purposes such as radio, television, books, newspapers, magazines, and so on. The media is not just a tool and their information, but also to learn the process, because the information or messages known only to notice the results of other people will not make that information becomes meaningful in his life.

In this section conducted a needs analysis to formulate the problem and find an appropriate solution. The most fundamental issues the learning process by using the discourse method. Students think monotonically, focus on matter presented by the teacher. Therefore, it is needed a method of learning interesting by using media tools. The media used should be able to help students in the process of remembering and recording matter taught by the teacher. Media mind mapping is a method that could be support the process. Media mind mapping makes the learning process more interesting and fun with colors, images and symbol. Mind mapping that has been developed in this study was mind mapping of earthquakes. It was one of the subject matter of Geography. An earthquake mind mapping consisted of:

definition of an earthquake, causes of an earthquake, mitigation of an earthquake, and consequence of an earthquake.

## Design

In this stage, the activities undertaken was to design the methods, teaching matter, and learning strategies. Products designed for this research in the form of a medium composed of curved lines that could be connected were to one keyword with another keyword by using colors and symbols. This learning media called as mind mapping. It was combined the lines, colors and symbols in one place to produce a concept that could be used as teaching matter for learning process. Mind mapping was used for the matter of earthquakes in social studies class I-3 in MTs Darul Ulum. This learning media was designed to attract and assist students in recording as well as considering the subject matter presented by the teacher, so that the learning process be more fun. Preliminary design drawings media mind mapping can be seen in Figure (a).

In this media, there were some elements that consist of:

- 1) The Learning Topic  
The design of contained in this media was a related to an earthquakes, such as: definition, causes, mitigation, and consequence.
- 2) The design of main idea, branches and sub-branches  
The main idea were layed in the middle of the paper, followed by the branches and sub-branches. Making the branch might was connected to the main topic and the making sub-branches must be connected with the branch. Each branch of the sub topics was written with keywords. Sub-topics on branch related to the main topic, while the sub-branch, sub-topics related to the branch, for example: the main topic on the mind mapping was an earthquake, then the sub topic on branch was mitigation of earthquakes, while the sub-topic on the sub branch were include risk map, infrastructure improvements, earthquake resistant houses, as well as socialization and simulation.
- 3) The design of colors, lines and symbols  
The used of color in the media mind mapping should be more than five colors. more colors used, more interesting anyway mind mapping is generated. Each branch should be a different color in order to facilitate students in remembering, for example, in branches and sub-branches that discusses the causes of earthquakes tinged with green, and at branches and sub-branches that discusses the definition of earthquakes tinged with red. The used of a line made with a curved shape and the used of symbols placed on each branch and sub-branch.

Khumaira, *et al.*, (2013) did the design stage by designing products that would be developed that were conceptual. Reasearch by Rena, *et al.*, (2014) a story idea was designed through the script, casting, location and background, the work schedule and storyboard. Another research by Juliantari, *et al.*, (2013) at the design stage, to design a media that would be developed with three types of activities that was create flowcharts, storyboards, and display media design.

## Development

The development stage was producing a media that would be used in the learning process. At this stage was produced a media mind mapping. In the making of media mind mapping, there are several elements, including main topic, branches, sub-branches and symbols support. Media mind mapping validated by two experts consisting of one expert in social studies teaching and an expert in education teaching. Validation was conducted to determine whether the media should be developed or not. In preliminary design of mind mapping (Figure 1 (a)) media were found some weakness so that the elements needed to change for the better and more attractive. These changes included some elements below:

- 1) Preparation branch  
A change in the elements of the branch. In the initial design, the branch line is not connected to the sub-branch line, so it looks branch just explained the main topics and did not explain the sub-branch. Supposedly, the manufacturing branch of the main topics connected to the sub-branches, so that explanation on the main topic with sub topics be synchronized. Making the branches and sub-branches that have been revised as shown in Figure 1 (b).

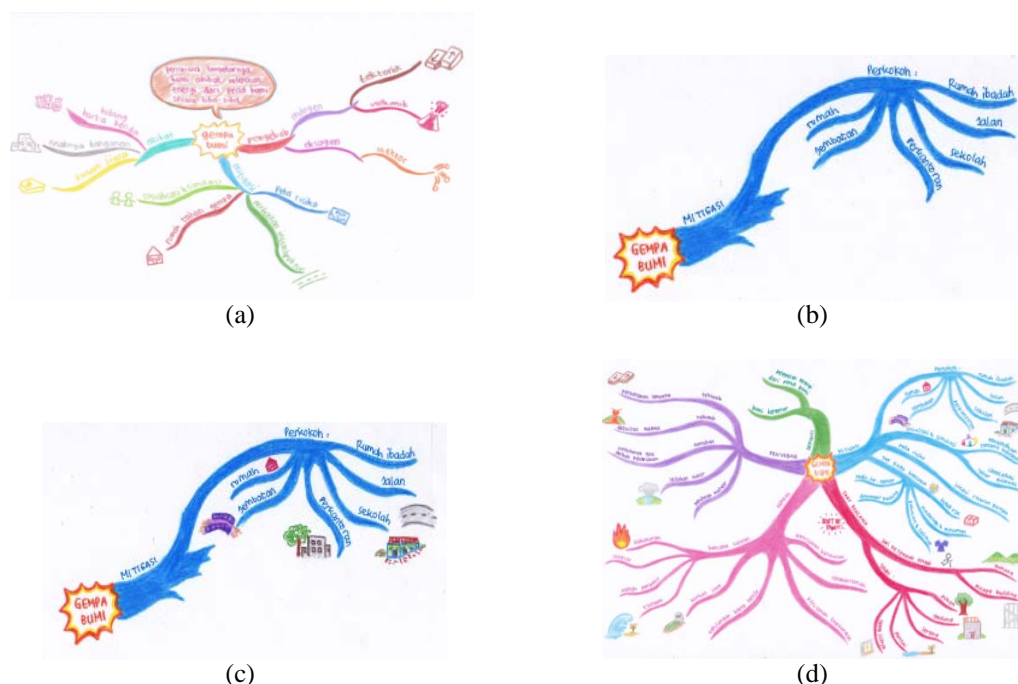


Figure 1. Design of Media Mind Mapping: (a) the preliminary design, (b) branches and sub-branches, (c) symbols were created, and (d) the revised media

## 2) Added of symbols

There were some additional symbols on mind mapping revised. Symbols located at the end of the sub-branch. Symbols must be made in accordance with the main idea of the sub-branch. Examples of symbols can be seen in Figure 1 (c).

Some suggestions from the validator into the input to produce a better mind mapping again. The revised media results can be seen in Figure 1 (d).

Mind mapping was revised and consisted of the main topics, branches, sub-branches and symbols. There are five branches of the main topics. The fifth branch each had sub-branches and symbols. Lines at branches and sub-branches arch-shaped and connected to the main topic. At each branch and sub-branch of the main topics of discussion are called sub-topics and is written in the form of keywords. This media must be given a variety of colors to make it look attractive and more vibrant. The combination between colors, symbols, shapes and lines can be easier for the brain to absorb information received. In the making of media mind mapping with several steps in a sequence that would be formed a media mind mapping intact. According Widura, (in Imaduddin, 2012) in education and learning, purpose, usefulness and mind mapping application are numerous, among others, to summarize, review (review), noted, teaching, book, presentation, research and management time. So its use can encourage students to get used complete with pictures and symbols to facilitate understanding of the objects or real circumstances.

Mind mapping has many uses, especially for learning and teaching. For the purposes of learning, mind mapping was very useful when we summarize, record and review. For teaching, mind mapping was very useful to applied at the time the teacher notes, preparing the subject and manage the time. Use mind mapping for teaching and learning purposes would be greatly assist the process of learning and teaching itself (Silaban, 2012).

## Implementation

The implementation stage is the stage of implementing the learning activities with applying a media mind mapping in the learning process. At this stage conducted trials activities with media mind mapping in grade I-3 MTs Darul Ulum Banda Aceh with a sample size of 30 students. Trials phase began by showing media mind mapping to students. Students were given an explanation of how to map their ideas about the earthquake subject with line, colour images and symbols. After being given an explanation of how to make mind mapping, students are given an explanation of earthquake matter. The matter provided include aspects of definition, what to do when an earthquake occurs, what causes

earthquakes, how the impact and mitigation of earthquake. Furthermore, students were produced a media mind mapping. Each student was given paper and colored pencils to create the mind mapping. They made a mind mapping in accordance with the subject of earthquakes that have been taught. The students were accompanied by researchers and teachers. Then the result of mind mapping of each student was collected and given scores. The results obtained, there are 22 students were categorized as skilled and as many as eight students belonging to the category of quite skilled. Some documentation during the learning process can be seen as Figure 2.



Figure 2. Implementation of mind mapping: (a) an explanation of how to produce mind mapping, (b) and (c) students were making mind mapping, and (d) the products of the student's mind mapping

Results of research by Hartanto, (2013) showed that the ADDIE model implementation could be improved student learning outcomes, seen from the average value of the end of student learning outcomes after the implementation ADDIE model of learning is greater than the average initial value of student learning outcomes. Additionally, Arini, *et al.*, (2013) also said that learning by using ADDIE models could be build students' critical thinking skills

## Evaluation

At this stage, the evaluation of learning activities by mind mapping and see the impact of media development mind mapping on students' knowledge and preparedness to earthquake. Mind mapping students' result was evaluated and the results of these evaluations were used to see whether the mind mapping had been developed applicable and useful for learning or not.

### Evaluation of Developed Mind Mapping

Mind mapping was validated by two expert validators. Results of the feasibility of the media by the percentage of the value of the validator 1 were 87.5 per cents, which mean the mind mapping into the category of very decent. While the results of the feasibility of the media by the percentage of the value of the validator 2 was 95.31 percent, which means the media mind mapping was also included into the category of very decent. These results indicated that the media mind mapping was very feasible to use in presenting the material in the learning process. Here were some suggestions from both validators about media mind mapping, included:

- 1) The material described in mind mapping was too little, therefore need to be added again. The addition of these three aspects into five aspects, including: definition, causes, mitigation, during a disaster, and that impact.
- 2) Branch shape too rigid and not connected to the sub-branch. So the form was changed to a more curved branches and continued to sub branch.
  - There was a change in the aspect of branches, from four to five branches, while the sub-branches added some discussion depending on the branch.

- In the definition of material, there were two sub-branches. On the matter the cause, there were five major sub-branches and three smaller sub-branches.
  - Furthermore, the materials mitigation, there were four major sub-branches and 14 sub-branches small.
  - For the material time of the disaster, there were two major sub-branches and seven sub-branches small, and the material impact of the six sub-branches are large and four smaller sub-branches.
- 3) The use of color was too simple, for more vivid colors so it can look attractive. Changes made to the color of each sub-branch according to the branch. Curved lines, forms the larger branch of the sub-branch and symbols contained in each sub branches in accordance with the discussion on the sub branch.

Figure 3 shows the mind mapping before and after revised.

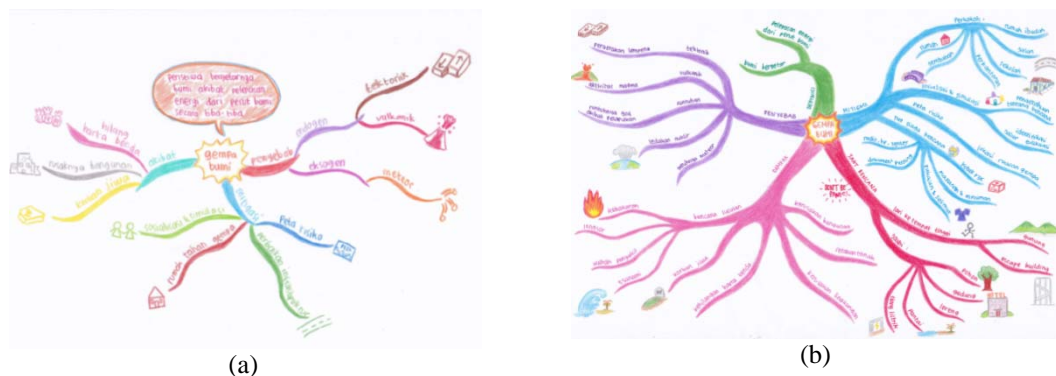


Figure 3. Mind Mapping: (a) before revised done, and (b) after revised

### Mind Mapping Student Assessment

Mind mapping was assessed using an assessment format with a score of 1 to 4. The results of assessment scores of all students in each of the indicators of produce mind mapping was summed then calculate. Results showed that about 22 students were categorized as skilled with a percentage value of 73.33 percent and 8 students who were categorized quite skilled with the percentage value of 26.66 percent. Mind mapping graphs the percentage of students can be seen in Figure 4.

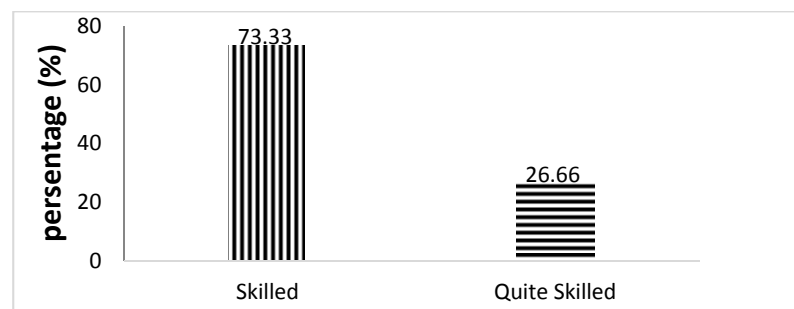


Figure 4. Percentage of Results Students Mind Mapping Products

Based on the Figure 4, it can be concluded that the highest number was the number of students in the skilled category. In the assessment of students who received skilled categories, as much as 73.33 percents. It showed that mind mapping was made in accordance with aspects assessed. Aspects assessed include determining the layout of the main ideas, the use of letters, symbols, color variations, the suitability of the matter, the use of keywords and linkage branches and the main idea. In the assessment of students who got quite skilled categories, as much as 26.66 percents. It showed that students' understanding on the use of capital letters, symbols or images and ideas written in narrative form



sentences still less appropriate. Based on the results of research conducted by Riyanti, (2012) showed that excess learn to use mind mapping was able to focus the attention of students, stimulate students' motivation, learning more fun and not boring because learning to use mind mapping as if presented concretely and thus students can feel the varied learning. Another result of research conducted by Ananggih, (2013) showed that the application of learning mind mapping can enhance students' understanding of class X 2 SMAN 1 Garum, seen from the results of an assessment of understanding of all the students in the two meetings have categories understanding of the above categories of understanding enough and the final value cycle in may also indicate an increase of 89%.

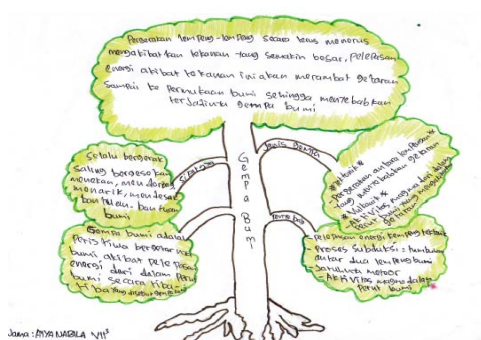
Figure 5 (a) and (b) shows the mind mapping to the skilled categorized because there was conformity to the aspects that serve as assessment indicators. Laying down the main ideas in the middle position, followed by a branch in accordance with the order of the matter and accompanied by pictures or symbols. The use of colour was so varied, that made mind mapping look colourful. All ideas were written in the form of keywords and short sentences in the form of points, so that mind mapping was produced to be good.



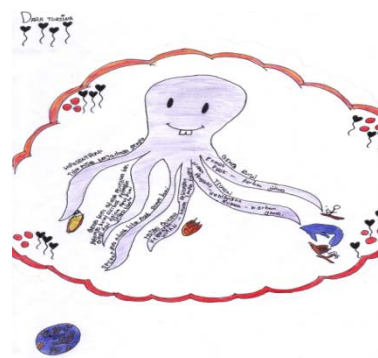
(a)



(b)



(c)



(d)

Figure 5. Results of Mind Mapping Students: (a) the first skilled mind mapping student, (b) the second skilled mind mapping student, (c) the first quite skilled mind mapping students, and (d) the second quite skilled mind mapping student.

Figure 5 (c) showed the mind mapping in categorized quite skilled which were students still lack the courage to give a variation of colour so mind mapping looks less attractive. Colours are monotonous and not accompanied by pictures or symbol on the branch makes it very difficult to remember. Therefore, including the mind mapping over skilled is enough. In addition, Figure 5 (d) also shows the mind mapping that considered to be quite skilled because of the aspects of the judgment. The student was still not able to arrange the layout of the main idea, the idea of branches and subsidiaries in the keywords without any links between the general idea, the use of the symbol does not correspond to the idea branch and provision of colour was very stiff, so make mind mapping look less alive.



## Conclusion

Based on the above results, the conclusion that media mind mapping was developed by five stages: analysis, design, development, implementation and evaluation. Results of the validation by experts showed that the media mind mapping was feasible. This media could be facilitated the students to record and understand the lessons, especially on the matter of earthquakes. It was advisable for teachers to use the model of learning by using media mind mapping as a method for teaching in other subjects and for students are expected to be able to apply these methods to the learning process to help students understand the lesson.

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